**How to Cite**:
Al-Ani, A. A., & Al-Rawai, M. K. (2022). ISO urban quality to measure the level of efficiency of urban transport. *International Journal of Health Sciences*, *6*(S6), 7420–7430. https://doi.org/10.53730/ijhs.v6nS6.11892

# ISO urban quality to measure the level of efficiency of urban transport

**Abdulkareem Adil Al-Ani**
University of Fallujah, Iraq
Email: abdalkareem.adel@uofallujah.edu.iq

**Asst. Prof Dr. Moheeb Kamel Al-Rawai**
University of Baghdad, Iraq
Email: dr.mohebalrawi@iurp.uobaghdad.edu.iq

***Abstract***---Providing and improving city services is critical to local governments, decision-makers, planners, and international and civil society organizations. Therefore, the International Organization for Standardization (ISO) sought to develop the standard specification 37120 under the name (Sustainable Cities and Communities - Indicators of city services and quality of life) to measure the efficiency of services for cities and to grant it the ISO certificate in urban quality through a set of indicators for various areas of life in the city. Including the field of urban transport is the basis of development and is directly related to the lives and jobs of the city's residents, where the efficiency of urban transport in the study area (the city of Fallujah) will be known in light of the ISO 37120:2018 standard and compared with the cities (Amman and Toronto) using statistical analysis programs, where the results showed fairly equal between the two cities (Fallujah and Amman) and a large gap between the two cities (Fallujah and Toronto). The research suggested making improvements to the transportation network in the study area.

***Keywords***---ISO, indicators, sustainable development, urban transport, quality of urban life.

## Introduction

Cities and local governments need many measures and procedures to provide the best services, preserve resources, and ensure a healthy and appropriate life for all residents. The overpopulation that cities suffer from and the problems resulting from it, as well as the economic and environmental problems, require increased attention and a serious stance on the increase in population growth and its consequences. The United Nations Department of Economic and Social Affairs

report for the year 2018 indicates an increase in the urban population. This percentage will reach 80% by 2050, and 33% of major cities will have a population of more than ten million people. Consequently, this increase increases energy consumed to reach 70% and 75% in an increase in the percentage of waste, gas emissions, and global warming produced by cities (United Nations, DESA, 2018).

Cities must plan from now to be able to provide the resources and services needed to ensure their residents' survival and prosperity and provide the best services to their residents. Therefore, ISO international standards provide the tools, foundations, and platforms needed to move cities into the future. These standards represent an international consensus on best practices that improve a city's function and achieve the United Nations Sustainable Development Goals to end poverty, protect the planet, and ensure prosperity for all. These include comprehensive frameworks that city leaders and planners can use to set goals and priorities for making their cities more sustainable, in addition to specific guidelines for energy management systems, road safety, smart transportation, and excessive water consumption, as well as the field of education, health, information security, and communications. It can be said that measuring and comparing cities and services provided by local governments with other cities, benefiting from experiences and following international standards, is an important incentive and goal towards achieving better services and improving the quality of urban life.

## Literature Review

### ISO

The challenges that cities face and will continue to face in the future are complex and multi-sectoral. Transportation and utilities, water supply and sanitation, energy, food, information security, and climate change are just some pressure points that will be affected by rising urbanization (Colding and Barthel, 2017). In order to keep pace with the rapid development and the massive technological revolution, reduce the waste of natural resources, solve various environmental problems resulting from population inflation and increase the growth rate, work towards smart and sustainable cities and comply with the principles of sustainability, the International Organization for Standardization worked to adopt the development of specifications and standards for cities under the name (cities and communities sustainable - indicators of city services and quality of life). Work began in 2012 with the formation of a special committee responsible for issuing these international standards under the name of the Committee (TC/268), which is the first committee specialized in this field to help cities develop, be resilient, take into account intelligence and achieve sustainability.

The committee's work continued for two years of continuous work, during which six international meetings were held, five drafts were, and 300 comments were published. The first standard was issued in 2014, which is the ISO 37120:2014 standard (Hurth and McCarney,2015). The ISO 37120:2014 standard includes several indicators, which are 139 indicators (46 core indicators, 54 supporting indicators, and 39 profile indicators). Furthermore, the main indicators are

required to demonstrate performance in providing city services and quality of life. The supporting indicators are recommended to demonstrate performance in providing city services and quality of life. While profile indicators provide basic statistics and background information to help cities compare, these indicators are useful references for cities (ISO 37120, Sustainable development of communities, 2014).

These indicators are useful in measuring the performance and services of cities and the quality of urban life in them. These indicators can be applied to wide areas and different topics related to the city, such as economy, health, education, urban planning, transportation, and others. The ISO 37120:2014 standard addresses seventeen different areas. Four years later, the International Organization for Standardization issued a revised version of the ISO 37120 standard, as the revised version of 2018 included (128) indicators (45 core indicators, 59 supporting indicators, and 24 profile indicators). The attendees deleted 20 basic and supporting indicators and added 24 new ones. Additional indicators focused on culture, urban agriculture, food, vacancy rates, and living space (Berman and Orttung, 2020) .

**Sustainable Development and ISO 37120**

Sustainability indicators have become an important part of the concerns of countries and many governmental, non-governmental, and civil society organizations. The most important is the United Nations (Le Blanc, 2015). At a time when global human rights organizations are concerned with global goals for the social and environmental development of the planet, the Technical Committee of the International Organization for Standardization (TC/268) has developed indicators of urban services and the quality of city life (Lehner *et al.*, 2018). The International Organization for Standardization (ISO), through its development of the standard specification 37120 for the year 2018, was directly concerned with the sustainable development goals such as the third and fourth goals on health and education, as well as the eleventh goal of sustainable cities and communities. The ISO 37120:2018 specification defines its contribution to nine out of seventeen sustainable development goals, namely the goal (3-4-5-6-8-10-11-13-16) (ISO 37120, Sustainable development of communities, 2018).

**ISO and Urban Transport**

The transport sector is a basic pillar of the services the municipality and local governments provide because of its links with various sectors. Urban transport is the main factor of the city and the pulse of life, in addition to its important role in the development process. Therefore, the International Organization for Standardization was keen to give it great importance through the standard ISO 37120:2014 with a total of nine indicators, four of which are core indicators such as kilometres of high capacity public transport system per 100000 population and five supporting indicators such as commercial air connectivity (ISO 37120, Sustainable development of communities, 2014). In 2018, through the amendment of some of the indicators of the ISO 37120 standard and the addition of other areas for the quality of cities, a slight modification was made to the indicators of the theme of transport. The ISO 37120:2018 standard specification

includes eight indicators, including two core indicators, five supporting indicators, and one profile indicators (ISO 37120, Sustainable development of communities, 2018). Table No. (1) compares the core indicators and the indicators supporting the transport theme, as stated in the ISO 37120 standard for 2014 and 2018.

Table 1
The difference between the core and supporting indicators in the ISO 37120 standard for the year 2014 and 2018 in the theme of transport

| No. | ISO 37120: 2014 | ISO 37120: 2018 |
|---|---|---|
| 1 | Kilometres of high capacity public transport system per 100000 population (core indicator) | Kilometres of public transport system per 100000 population (core indicator) |
| 2 | Kilometers of light passenger public transport system per 100000 population (core indicator) | Annual number of public transport trips per capita (core indicator) |
| 3 | Annual number of public transport trips per capita (core indicator) | Percentage of commuters using a travel mode to work other than a personal vehicle (supporting indicator) |
| 4 | Number of personal automobiles per capita (core indicator) | Kilometres of bicycle paths and lanes per 100000 population (supporting indicator) |
| 5 | Percentage of commuters using a travel mode to work other than a personal vehicle (supporting indicator) | Transportation deaths per 100000 population (supporting indicator) |
| 6 | Number of two-wheel motorized vehicles per capita (supporting indicator) | Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods (supporting indicator) |
| 7 | Kilometres of bicycle paths and lanes per 100000 population (supporting indicator) | Average commute time (supporting indicator) |
| 8 | Transportation fatalities per 100000 population (supporting indicator) | Transportation profile indicators |
| 9 | Commercial air connectivity (number of non-stop commercial air destinations) (supporting indicator) | |

Source: The researcher, based on (ISO 37120: 2014, P 75-82) and (ISO 37120: 2018, P 66-72)

**Urban Quality of Life**

The concept of quality of life is a broad concept linked to many aspects, including psychological, social, and economic aspects, as well as environmental aspects. Because of its many ramifications and its connection to multiple aspects, it has been defined as individuals' perception of their position in urban life based on the values in which they live and the level of their culture, as well as concerning their interests and goals in this life (Sun, *et al.,* 2019). The concept of urban quality of life is multidimensional. It has many areas that the residents of the urban community may see with a different perspective and evaluation in the light of their interests and according to the priorities of each individual in the community (Tonon, 2020). The importance of quality lies in economic development, which is the backbone of the development of any society, as well as increasing the per capita income and improving the standard of living, as the economic aspect is the main and important component to maintaining the quality of life (Rappaport, 2009).

Urban transport affects the economic success and quality of life in the city. Noise and traffic congestion have a local impact on the quality of life in the city, while commuter travel time affects the city's economic success and the global environment on a broader geographical scale where emissions of gases affect climate change and thus have an impact. Global (WBCSD, 2015). Transport is related to energy that affects the global environment, public finances that affect economic success, and the diversity of spatial functions that ultimately affect the quality of life (Candia, *et al.*, 2019). The term urban quality of life has been used to cover multiple aspects of urban life and represents an assessment tool based on subjective and objective indicators and in different contexts (Fleury-Bahi, *et al.,* 2017). The importance of measuring the quality of life and comparing countries or cities and urban areas, and even comparing companies has become of great importance because of the improvement in service provision and work towards a better life (Biagi, *et al.,* 2018).

**Sustainable Development and Urban Quality of Life**

The concept of sustainability is a broad approach that everyone is talking about in a period when environmental problems caused by various human activities require serious solutions. The basic meaning of sustainability is the ability to continue and improve the quality of life (Gazzola and Querci, 2017). Sustainability is a multidimensional concept that most countries and NGOs have adopted. It has become an urgent necessity in the planning process, whether urban or regional planning, at the highest levels. The progress in sustainable development and quality of life are two complementary processes in particular where the concepts of sustainability are affected by the concepts of quality of life (Sinha, 2019). Sustainable development is related to improving the quality of life through education, justice, community participation, and recreation. It includes equity in access to basic services, housing, and transportation, and this is related to social sustainability. While economic sustainability includes enhancing resources, attracting investments, raising the level of income, and increasing local production, and this is linked to environmental sustainability through preserving nature and natural resources and reducing pollution and gas emissions, which

means that the activities of future generations will not be harmed by current generations, taking into account satisfaction, well-being, and continuous improvement, in providing services.

**The Practical Part of the Research**
**Study Area**

The city of Fallujah is located at the beginning of the sedimentary plain, between latitudes (33°21'09" - 33°17'47") in the north and longitudes (43°49'33" - 43°44'58") in the east, and the Euphrates River borders it to the west. It is about (61 km) northwest of the Iraqi capital, Baghdad, and the city of Ramadi, the center of Anbar Governorate, about (45) km. The city of Fallujah is the administrative center of the Fallujah district, which includes two administrative units (the district center and Saqlawiyah district from the northwest). The most important characteristic of the city of Fallujah is its location on the bank of the Euphrates River, which gives the city a distinctive shape through the diversity of land uses and the increase in the percentage of green and open areas, as well as the location of its eastern and western ends on the international highway that connects Anbar Governorate with the rest of Iraq's governorates and neighboring countries. Knowing the indicators of ISO 37120:2018 for the theme of transport, these seven indicators were calculated as mentioned in the standard on the city of Fallujah. This is in addition to calculating the population according to the area of the new basic design, which is 358,835 people, as shown in Table (2). Note that the required data was calculated with the help of the data of Fallujah Municipality and Fallujah Traffic Directorate.

Table 2
ISO 37120: 2018 indicators in the theme of transport in the city of Fallujah

| No. | ISO37120: 2018 | Indicator value |
|---|---|---|
| 1 | Kilometres of public transport system per 100000 population | 2.62 |
| 2 | Annual number of public transport trips per capita | 1.74 |
| 3 | Percentage of commuters using a travel mode to work other than a personal vehicle | not available |
| 4 | Kilometres of bicycle paths and lanes per 100 000 population | 0.865 |
| 5 | Transportation deaths per 100000 population | 2.07 |
| 6 | Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods | not available |
| 7 | Average commute time | 17 minutes |

Source: The researcher, based on (the Fallujah Municipality and Fallujah Traffic Directorate)

From the above, it is clear that there is a gap in the transport indicators due to the lack of necessary data and statistics. These are supporting indicator, number two out of five indicators. The percentage of applying the indicators and the size of the gap can be extracted through the equations below:

Percentage of indicators applied = number of indicators available / number of indicators required * 100%

= 5 / 7 * 100% = 71.43

Gap size = (1- Number of indicators available / Number of indicators required) * 100%

= (1- 5 / 7) * 100% = 28.57

**Comparison of ISO 37120:2018 indicators in the theme of transportation in the city of Fallujah with international cities**

Measuring the efficiency of urban transport is a challenge because of the expansion of its elements, the large number of systems, and its connection to people's lives and the performance of their jobs. Therefore, the comparison process is a way to show the efficiency of the urban transport system between cities, especially those cities that are characterized by the quality of their services, and to obtain an indicator to show the current situation compared to developed cities and what is required to reach the characteristics of those cities. On the other hand, the ISO 37120 standard helped to compare cities in terms of urban transport and service performance as well as the quality of life, so the ISO 37120: 2018 indicators in the field of transportation for Fallujah will be compared with two cities, one of them is an Arab city, Amman, and the other is an international city, the city of Toronto. These two cities are part of the World City Data Council, the organization concerned with implementing ISO 37120: 2018. Data for these two cities were obtained from the official website of the Greater Amman Municipality, the Toronto Municipality website, Statistics Canada, and the World Council for City Data website, which is an official and approved website, as shown in Table (3).

Table 3
ISO 37120: 2018 indicators in the theme of transport of cities (Fallujah, Amman, Toronto)

| No. | ISO37120: 2018 | Fallujah city Population 385,835 Area 205 km2 | Amman city Population 4,512,700 Area 1680 km2 | Toronto city Population 2,794,356 Area 634 km2 |
|---|---|---|---|---|
| `1 | Kilometres of public transport system per 100000 population | 2.62 | 26.309 | 169.27 |
| 2 | Annual number of public transport trips per capita | 1.74 | 7.3 | 233.27 |
| 3 | Percentage of commuters using a travel mode to work other than a personal vehicle | not available | 20% | 58% |
| 4 | Kilometres of bicycle paths and lanes per 100 000 population | 0.865 | 0.26 | 21.22 |
| 5 | Transportation deaths per | 2.07 | 3.86 | 2.63 |

| | | | | |
|---|---|---|---|---|
| | 100000 population | | | |
| 6 | Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods | not available | not available | 23% |
| 7 | Average commute time | 17 minutes | 45 minutes | 42 minutes |

Source: The researcher, based on data from the cities of (Fallujah, Amman, and Toronto)

By noting Table (3), it is clear that there are differences in these quantitative indicators from the two sides. The first is the difference in size and population of Fallujah from the cities of Amman and Toronto. The second is the difference in the indicators themselves in terms of the results of the indicator and its value between an integer and a percentage. In order to obtain accurate results and remove these differences, these results were analyzed by statistical analysis methods. The significant differences between the means were compared with the Least Significant Difference (LSD) test, which is a test used to compare the significant differences between two or more averages, as:

**LSD**

$$\sqrt{\frac{2\,mse}{r}}*$$

As well as using the Chi-Square test (Chi-Square: x2), which is a statistical hypothesis test in which the distribution of samples for the test statistics, i.e., when we have the differences as percentages without repetition, where:

$$\mathbf{x^2=}\ \sum \frac{(O-E)^{\blacktriangleleft}}{E}$$

Whereas the statistical program (Statistical Analysis System -SAS 2018) was used to calculate these two tests in order to analyze the data to study the indicators of cities (Fallujah, Amman, Toronto) in the light of the ISO 37120: 2018 standard specification for the theme of transport, as shown in Table (4).

Table 4
Analysis of the indicators of cities (Fallujah, Amman, Toronto) ISO 37120: 2018 for the theme of transport

| No. | ISO37120: 2018 | Fallujah city Population 385,835 Area 205 km2 | Amman city Population 4,512,700 Area 1680 km2 | Toronto city Population 2,794,356 Area 634 km2 | P-value |
|---|---|---|---|---|---|
| `1 | Kilometres of | 2.62 ±0.09 c | 26.309 ±1.37 | 169.27 ±8.53 | 0.0001 ** |

| | | | | | |
|---|---|---|---|---|---|
| | public transport system per 100000 population | | b | a | |
| 2 | Annual number of public transport trips per capita | 1.74 ±0.18 b | 7.30 ±0.72 b | 233.27 ±13.47 a | 0.0001 ** |
| 3 | Percentage of commuters using a travel mode to work other than a personal vehicle | 0.00% c | 20.00% b | 58.00% a | 13.47 ** (0.0001) |
| 4 | Kilometres of bicycle paths and lanes per 100 000 population | 0.865 ±0.06 b | 0.26 ±0.05 b | 21.22 ±0.98 a | 0.0001 ** |
| 5 | Transportation deaths per 100000 population | 4.40 % | 3.86 % | 2.63 % | 0.726 NS (0.329) |
| 6 | Percentage of population living within 0,5 km of public transit running at least every 20 min during peak periods | 0.00% b | 0.00% b | 23.00% a | 9.02 ** (0.0016) |
| 7 | Average commute time | 17 ±0.62 b | 45 ±1.57 a | 42 ±1.33 a | 0.0001 ** |

Source: the researcher, based on (Statistical Analysis System -SAS 2018)

Notes:
* Significant 0.05 (P≤0.05) Significant.
** Highly Significant 0.01 (P≤0.01).
NS means insignificant.

The averages with different letters differ significantly, the averages with the same letters do not differ significantly, and the highest mean takes the letter (a) downward.

**Statistical Analysis Results**

From the above results, it is clear that there is a vast difference in the quality of the transportation system in the city of Toronto from the cities of Amman and Fallujah in terms of results, as well as concerning the availability of data led to the calculation of the value of all indicators required in the standard specification.

At the same time, the city of Amman is equal to the city of Toronto in only two indicators: the percentage of deaths due to traffic accidents and the average travel time. This indicates the extent of the development of the field of transportation in the city of Toronto from the cities of Fallujah and Amman. As for the city of Fallujah, the number of available indicators was (71.43). This is a good percentage, especially since the unavailable data were related to the values of a supportive indicator and not a basic indicator. On the other hand, the value of the traffic accident index was equal to the index of the cities of Toronto and Amman.

On the other hand, there is equality in the values of three indicators between the cities of Fallujah and Amman, which are the indicator of the number of annual trips by public transport per capita, the length of the bicycle path, and the indicator of the percentage of the population who live within half a kilometer of public transport stops. At the same time, the result of the rest of the indicators was lower than the cities of Toronto and Amman, which are only two indicators, which are the length of the public transport network and the percentage of passengers who use public transport instead of a personal vehicle on a business trip because its data is not available. Therefore, the research suggests intensifying the efforts of the municipality and specialists by establishing a central database, as well as expanding and improving the quality of public transport in the city and adding new paths for bicycles. This is in addition to using control systems at traffic intersections and the transition towards sustainable cities.

**Conclusions**

- Through the standard ISO: 37120, it is possible to measure and compare any of the seventeen areas mentioned in the standard and compare its results with other cities to show the extent of its efficiency and quality. In addition, there are several organizations concerned with improving the life of society other than the International Organization for Standardization, whose approach can be followed and applied Its principles are to improve the quality of urban life.
- The process of comparing medium-sized cities with large cities will contribute to raising the city's status and increasing interest in it, and this will thus reflect on the well-being of life, attract investments and increase job opportunities.
- The quality of urban life is related to the efficiency of the services provided by the responsible authorities and the extent to which the city's economic, social and environmental components are interconnected.
- The percentage of indicators available in the city of Fallujah was good, especially the main indicators, as the available data were sufficient to obtain the values of five indicators out of seven.
- 5The field of transport in the city of Fallujah, according to the indicators of ISO 37120: 2018, is good compared to the city of Amman through equality in a basic indicator out of two and three supporting indicators out of five indicators, while the results of the statistical analysis showed the superiority of the city of Toronto over the city of Fallujah All its basic and supportive indicators, except for the sixth indicator, were equal.

**References**


Alamsyah, T., Marianthi, D., Hayati, W., & Usrina, N. (2021). Drug user behavior about the development and rehabilitation process in Banda Aceh correctional institution. International Journal of Health & Medical Sciences, 4(1), 88-94. https://doi.org/10.31295/ijhms.v4n1.1348

Berman, M. and Orttung, R. W. (2020), Measuring Progress toward Urban Sustainability Do Global Measures Work for Arctic Cities, *sustainability*, (12), 1- 15.

Biagi, B.; Ladu, M. G. ; Meleddu, M. (2018), Urban quality of life and capabilities An experimental study, *Ecological Economics*, (150), 137-152.

Candia, S.; Pirlone, F. ; Spadaro, I. (2019), Sustainable urban mobility and urban safety and security: a case study of the city centre of Genoa, Italy, *WIT Transactions on the Built Environment*,(182), 187-198.

Colding, J. and Barthel, S. (2017), An urban ecology critique on the Smart City model, *Journal of Cleaner Production*, (164), 95-101.

Fleury-Bahi, G.; Pol, E. (2017), Navarro, Handbook of Environmental Psychology and Quality of Life Research, *Springer International Publishing*, 1-587.

Gazzola, P. and Querci, E. (2017),The Connection Between the Quality of Life and Sustainable Ecological Development, *European Scientific Journal*, 13(12), 361-375.

Hurth, V. and McCarney, P. (2015), International standards for climate-friendly cities, *Nature Climate Change*, 5(12), 1025-1026.

ISO 37120:2014 (Sustainable development of communities — Indicators for city services and quality of life), 1-85.

ISO 37120:2018 (Sustainable development of communities — Indicators for city services and quality of life), 1-121.

Le Blanc, D. (2015), Towards Integration at last The sustainable development goals as a network of targets, *Sustainable Development*, 23(3), 1-12.

Lehner, A. ; Erlacher, C. ; Schlögl, M. ; Wegerer, J. ; Blaschke, *et al.*, (2018), Can ISO defined urban sustainability indicators be derived from remote sensing an expert weighting approach, *Sustainability*, (10), 1-31.

Rappaport, J. (2009), The increasing importance of quality of life, *Journal of Economic Geography*, 9(6), 779-804.

Sinha, B. R. K. (2019), Multidimensional Approach to quality of life issues: A Spatial Analysis, *Springer International Publishing*, 1-772.

Sun, D. ; Lee, H. ; Yim, H. ; Won, H. ;Ho Ko, Y. (2019), The impact of sarcopenia on health-related quality of life in elderly people: Korean National Health and Nutrition Examination Survey, *The Korean Journal of Internal Medicine*, 34(4), 877-884.

Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). The COVID-19 pandemic. *International Journal of Health Sciences*, *5*(2), vi-ix. https://doi.org/10.53730/ijhs.v5n2.2937

Tonon, G. H. (2020), Teaching quality of life in different domains, *Journal of Psychology in Africa*, 23(5), 546–547.

United Nations, Department of Economic and Social Affairs, World Population Prospects, New York, (2018), 1-38.

World Business Council for Sustainable Development (WBCSD), (2015), Sustainable urban mobility, Sustainable Mobility Project, Indicators Work Stream, 1-62.